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Airway Science Curriculum Demonstration Project: Summary Of Initial Evaluation Findings

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16. Abstract

The performance, perceptions, and characteristics of Airway Science hires were compared with those of traditional hires. As of May 12, 1987, a total of 197 Airway Science candidates had been selected into FAA occupations. The demographic characteristics of Airway Science and traditional hires tended to differ, although these differences were more marked for Air Traffic Control Specialists and much less so for Electronics Technicians.

Findings for two of the eight project objectives were noteworthy. First, there was considerable evidence of the academic community's interest in and support of the Airway Science curriculum. Second, lower performance on the Air Traffic Control Specialist Initial Qualification Screen program (Terminal/ En route) was found for Airway Science hires. Few strong, consistent findings were observed for the remaining Airway Science project objectives for which data were available.

Two limitations associated with the project evaluation at this time were described. First, greater numbers of both Airway Science hires (particularly Airway Science graduates) and traditional hires are required for a full examination of the project's components. In addition, more time is needed to track the attitudes, perceptions, and performances of project participants, most of whom are still in the early stages of training. Differences between the samples may be expected to emerge over time.

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AIRWAY SCIENCE CURRICULUM DEMONSTRATION PROJECT:

SUMMARY OF INITIAL EVALUATION FINDINGS

INTRODUCTION

The Airway Science Curriculum Demonstration Project was designed to investigate the effectiveness of an alternative approach to recruitment and selection within five of the Federal Aviation Administration's (FAA) major occupations. Traditionally, individuals with highly technical backgrounds have been hired into the fields of Aviation Safety Inspector, Electronics Technician, and Computer Specialist. In addition, prior to 1981, many of the incoming Air Traffic Control Specialists had former military experience in controlling air traffic. Since that time, however, proportionally fewer entrants have been found to have air traffic control experience; their training, once hired into the FAA, is technical.

The designers of the Airway Science program believed that the FAA's focus on technical skills and expertise might limit employees' ability to smoothly adjust to the substantial technological and other changes that they are beginning to experience. Also, it was felt that the strong technical orientation might not serve employees as well as a broader background as they rise to supervisory and managerial positions. The Airway Science project reflects the FAA's interest in the implications of complementing the changing technological and managerial demands within the FAA with a professional workforce whose background combines technical knowledge with exposure to subjects ranging from aviation, the physical sciences, and computer technology to management, the social sciences, and the humanities.

In coordination with the FAA, a baccalaureate curriculum was developed by the University Aviation Association (UAA), a professional organization of non-engineering collegiate aviation educators. The resulting Airway Science degree includes core coursework in general studies, science/technology/mathematics, management, computer science, and aviation. In addition, five areas of concentration (AOC) supplement this curriculum core: Airway Science Management, Aircraft Systems Management, Airway Computer Science, Aviation Maintenance Management, and Airway Electronic Systems. Academic institutions interested in receiving official FAA recognition of their Airway Science programs undergo a thorough review which includes a detailed examination of the proposed curriculum as well as a visit to the school to determine whether the program meets the Airway Science program spirit and intent. The FAA has contracted with the UAA for the services of the UAA Airway Science Curriculum Committee to conduct this program review function and to make a recommendation to the FAA regarding the merit of each Airway Science curriculum proposal.

Under the auspices of the Demonstration Project, the FAA was authorized to create an Airway Science register to facilitate the hiring of individuals with the previously described background. It should be noted that the relevant rating guides permit comparable work experience or training to substitute for educational requirements. Therefore, the Demonstration Project includes individuals who qualify on the basis of education alone, experience alone, or some education/experience combination. Airway Science candidates are eligible for the following FAA occupations: Air Traffic

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Control Specialist (ATCS) (GS-2152); Aviation Safety Inspector - Operations (ASI-OP) (GS-1825); Aviation Safety Inspector - Airworthiness (ASI-AW) (GS-1825); Computer Specialist (CS) (GS-334); and Electronics Technician (ET) (GS-856).

The Demonstration Project evaluation design was discussed in detail in the report, "An Interim Report on the Airway Science Curriculum Demonstration Project: Clarification and Elaboration of the Project Design" (Clough, 1986b). As the report explained, two separate research questions are meshed within the Airway Science Curriculum Demonstration Project objectives. The original project design was based on the premise that individuals with an Airway Science background were not being hired into the relevant FAA occupations through traditional methods. As a result of this assumption, an alternative selection strategy was developed which abandoned many of the traditional selection criteria in favor of evidence of an Airway Science background. Thus, new rating guides were developed for each occupation which attempted to identify those knowledges, skills, abilities, and other characteristics (KSAOs) that completion of an Airway Science degree provided, and then to equate work experience and college education with respect to these KSAOs.

The current study compared Airway Science hires (those hired using this alternative selection strategy) with traditional hires (those hired on the basis of the standard selection criteria). Specifically, the experimental group (ASC HIRES) comprised individuals selected from an Airway Science register into one of the five FAA occupations. The FAA Special Examining Division in Oklahoma City determines which Airway Science applicants are eligible for this register which dictates who may be placed in the experimental group. ASC HIRES were further subdivided on the basis of program eligibility into a 5 x 3 matrix which considers relevant college education along one axis and relevant work experience along the other. The comparison group (TRAD HIRES) contained individuals hired by traditional selection strategies since October 1983 who agreed to participate in the project evaluation by signing a consent form. This study was designed to investigate whether the Airway Science selection strategy results in: (a) the hiring of a different type of employee; and (b) differences in organizational measures of job satisfaction and success.

A second study was added to the demonstration project evaluation to examine more closely the influences of college education on the demonstration project objectives. Candidates with bachelor's degrees similar in some respects to the Airway Science major (as well as Airway Science graduates themselves) were eligible for the experimental group in this study. The method by which they were selected (Airway Science or traditional strategy) was not a factor in their placement into the experimental or comparison groups. The second study and findings associated with analyzing the information in this manner were described in detail in the original summative evaluation report (Clough, 1987). In general, few results differed from those found in comparing ASC and TRAD HIRES. One reason for this was that several of the occupations had few individuals who qualified for the experimental group on the basis of a specific type of college education. Interested readers are referred to the complete agency report; the second study is not further discussed in this paper.

This interim report summarizes the findings of the Airway Science Curriculum

Demonstration Project during its first 4 years. The agency report on which this paper is based (Clough, 1987) provided the empirical support for an FAA request to the Office of Personnel Management to extend the duration of the 5 year demonstration project an additional 4 years (with 1 more year for evaluation purposes). Those interested in more specific information on many facets of this evaluation effort are referred to the complete summative evaluation report (Clough, 1987).

Organization of This Report

In the Method section, demographic and other characteristics of the previously described project evaluation samples are presented. In addition, the questionnaires, supporting databases, and data collection procedures used to execute the project evaluation are briefly reviewed. The accumulated evidence for each of the eight project objectives is then presented in the Results section.

The Results section was organized on the basis of organizational goals which, in turn, subsume specific Airway Science project objectives (see Appendix A). An initial attempt was made to combine the data across occupations when occupation per se was not of central importance to the project objective. The relative influences of hiring status and occupation could then be tested. However, at times it appeared that there were real differences in the response patterns of individuals in each occupation. When empty cells prevented an analysis of the interaction between hiring status and occupation, this statistical approach was abandoned and examination of only the ATCS occupation was reported. In other words, when it was not possible to compare ASC HIRES and TRAD HIRES within each occupation, only information relevant to the ATCS ASC and TRAD HIRES is presented. All statistical analyses of the items in the Biographical Questionnaire include only Air Traffic Control Specialists (Terminal/En route) for it was the only occupation in which both ASC HIRES and TRAD HIRES responded.

Two occupational groups are not described after the next section of this report although both are currently under the purview of the Demonstration Project evaluation. The occupations are (a) Computer Specialist (GS-334) in which one Airway Science candidate had been hired and there were no comparison group members, and (b) Air Traffic Control Specialist (Flight Service Station) in which one Airway Science candidate had been hired. It was inappropriate to even include these people in overall comparisons between ASC and TRAD HIRES since it was not possible to determine occupation-specific influences. [Note: The original summative evaluation report (Clough, 1987) stated that a second Computer Specialist had been selected; the individual declined the appointment following the completion of that report and therefore was not included in the above counts.]

METHOD

Project Participants

Air Traffic Control Specialists (Terminal/En route) [ATCS (T/E)]. As of May 12, 1987, 98 ASC HIRES and 2774 TRAD HIRES had entered on duty. (Actually, according to our records, 116 Airway Science candidates had been selected; however, all were not yet with the agency.) Both the ASC and TRAD HIRES samples were predominantly men (ASC: 83.7%; TRAD: 85.7%) and nonminority

(ASC: 87.2%; TRAD: 92.9%). The average age of ASC HIRES (M = 25.88) and TRAD HIRES (M = 25.83) did not differ. As has been reported in the past (Clough, 1986a; 1986c), ASC HIRES were much more likely than TRAD HIRES to be certificated as a ground instructor, flight instructor, and pilot (student, private, commercial, airline transport). Six percent of the ASC HIRES and 11.6% of the TRAD HIRES had worked for the FAA prior to their appointments which coincided with their participation in the Airway Science project. The vast majority (79.5%) of ASC HIRES had completed a Bachelor's degree, whereas only 29.7% of TRAD HIRES had attained that educational level. Of the ATCS hires who had attended college, significantly more ASC than TRAD HIRES had earned credits in such subject areas as management, computer science, and aviation.

Respondents were asked to classify their Associate and Bachelor's degree aviation coursework into discrete categories. For example, aviation coursework taken toward an Associate and/or Technical/Military/Vocational-Technical degree was described as: (a) vocationally oriented (i.e., training directed toward a specific occupation and/or FAA certificate(s) rather than toward further education in a Bachelor's degree program); (b) baccalaureate-transfer oriented (i.e., training directed toward further education in a Bachelor's degree program rather than toward a specific occupation or FAA certificate); or, (c) other.

Aviation coursework taken toward a Bachelor's degree was placed into one of the following categories: (a) aviation operations (i.e., education focusing on the operation of aircraft on the ground or in the air such as Flight Engineer, Air Traffic Control, or Professional Pilot); (b) aviation technology (i.e., education focusing on ground support functions such as Avionics and Aviation Maintenance); (c) aviation management (i.e., education focusing on the management of personnel and/or operations or systems such as Aviation Administration/Management, Air Transportation Management, or Airline Management).

The focus of the aviation coursework taken by the two samples differed with proportionally more ASC HIRES concentrating in aviation management; the vast majority of TRAD HIRES had completed coursework focusing on aviation operations.

ASC HIRES were classified according to their eligibility for the Airway Science register. As Table 1 illustrates, 60.0% of ASC HIRES qualified, at least in part, on the basis of an Aviation Bachelor's degree. In addition, three hires graduated from FAA recognized Airway Science programs (two of the three had not yet entered on duty). Three Aviation graduates had prior FAA experience as Air Traffic Assistants (GS-2154) as did one of the non-Aviation majors. In addition, one Aviation graduate had worked with the FAA in a non-ATC-related position. Six Aviation graduates and three non-Aviation majors entered the FAA Academy more than once; it is not known whether these enrollments occurred prior to or following their Airway Science appointments.

Electronics Technicians [ET]. As of May 12, 1987, 48 ASC and 22 TRAD HIRES comprised this study. (Our records indicated 50 selections, with 48 having reported for duty.) Most ASC HIRES qualified for the Airway Science register on the basis of a combination of work experience and college education (see Table 2). All ASC HIRES were men as were 90.9% of the TRAD HIRES; also, the majority of both samples were nonminority (ASC: 88.6%; TRAD: 72.7%). The

Table 1. Airway Science Eligibility Classification of Air Traffic Control Specialists (Terminal/En route) (as of May 12, 1987)

Relevant Education	Relevant Work Experience: Prior to/ in lieu of Education		Relevant Work Experience: During/ Following Education		Relevant Work Experience: None		Total	
	n	%	n	%	n	%	n	%
Airway Science Graduate	0	.0	0	.0	3	3.0	3	3.0
Airway Science Mgmt	0		0		3		3	
Aviation Graduate	4	4.0	15	15.0	41	41.0	60	60.0
Operations	1		4		6		11	
Technology	2		1		5		8	
Management	1		8		24		33	
Other	0		2		6		8	
Aviation Major	0	.0	3	3.0	4	4.0	7	7.0
Operations	0		1		0		1	
Technology	0		1		1		2	
Other	0		1		3		4	
Non-Aviation Major	7	7.0	12	12.0	4	4.0	23	23.0
Computer Science	2		1		0		3	
Electronics	0		0		0		0	
Management	3		1		3		7	
Other	2		9		1		12	
Missing	0		1		0		1	
None	7	7.0	0	.0	0	.0	7	7.0
Total	18		30		52		100	

Classifications were missing for 16 Airway Science selections.

Table 2. Airway Science Eligibility Classification
(as of May 12, 1987)
Relevant Work Experience

Relevant Education	Prior to/ in lieu of Education			During/ Following Education			None			Total		
Occupation	ET	ASI-OP	ASI-AW	ET	ASI-OP	ASI-AW	ET	ASI-OP	ASI-AW	ET	ASI-OP	ASI-AW
Airway Science Graduate	0	0	0	0	1	1	0	0	0	0	1	1
Aircraft Systems Mgmt	0	0	0	0	1	1	0	0	0			
Aviation Graduate	2	3	1	0	5	1	0	0	1	2	8	3
Operations	0	2	0	0	2	0	0	0	0			
Technology	2	0	1	0	0	0	0	0	0			
Management	0	1	0	0	2	1	0	0	1			
Other	0	0	0	0	1	0	0	0	0			
Aviation Major	1	1	0	1	0	0	0	0	0	2	1	0
Operations	1	0	0	0	0	0	0	0	0			
Technology	0	0	0	1	0	0	0	0	0			
Other	0	1	0	0	0	0	0	0	0			
Non-Aviation Major	9	3	2	18	5	2	1	0	0	28	8	4
Computer Science	1	0	0	0	1	0	0	0	0			
Electronics	6	0	0	11	0	0	1	0	0			
Management	0	0	1	0	1	0	0	0	0			
Other	1	3	1	7	3	2	0	0	0			
Missing	1	0	0	0	0	0	0	0	0			
None	17	1	2							17	1	2
Total	29	8	5	19	11	4	1	0	1	49	19	10

Classification was missing for one ET selection.

Note. ET = Electronics Technician; ASI-OP = Aviation Safety Inspector - Operations; ASI-AW = Aviation Safety Inspector - Airworthiness

average age of ASC HIRES (M = 33.98) and TRAD HIRES (M = 39.13) did not differ significantly. In addition, over half of both ASC and TRAD HIRES received veteran's preference (ASC: 65.2%; TRAD: 75.0%). Starting grades of TRAD HIRES ranged from GS-3 to GS-12. The majority of ASC HIRES started in the specialty option of Technical Management or NAVAIDS/Communications whereas TRAD HIRES tended to be more evenly distributed across the specialties. Some change in specialties has been observed in both groups. Relatively few of either sample had earned a Bachelor's degree (ASC: 27.6%; TRAD: 7.7%), although an additional 31.0% of ASC HIRES (and 38.5% of TRAD HIRES) had completed an Associate degree.

Aviation Safety Inspectors - Operations [ASI-OP]. As of May 12, 1987, data were available on 19 ASC HIRES and 82 TRAD HIRES. One ASC HIRE had an Airway Science degree, 42.1% had completed an Aviation Bachelor's degree and all had prior work experience (see Table 2). Four of the 19 ASC HIRES (21.1%) were women, whereas only three of the 82 TRAD HIRES (3.7%) were women. Also, three (15.8%) ASC HIRES were minority (Hispanic); only 5% of the TRAD HIRES sample were minority (two were American Indian, one Black, and one Hispanic). The average age of ASC HIRES (M = 33.42) was lower than that of TRAD HIRES (M = 42.86). TRAD HIRES were much more likely than ASC HIRES to have received veteran's preference (ASC: 38.9%; TRAD: 81.8%). Although the entire ASC HIRES sample began in the specialty option of General Aviation, at least 29% of the TRAD HIRES entered within the specialty of Air Carrier. Two ASC HIRES have since converted to the Air Carrier specialty. Also, all ASC HIRES began as GS-7s; the majority of TRAD HIRES entered as GS-11s or GS-12s due presumably to their extensive flight and other relevant experience. The TRAD HIRES sample was designed to resemble (and therefore generalize to) the "typical" person hired on the basis of traditional hiring criteria; entrance at the GS-7 level is very rare in this occupation.

Biographical information was available for only eight ASC HIRES and 49 TRAD HIRES. Of those responding, six ASC HIRES (75.0%) and 22 TRAD HIRES (44.9%) had earned a Bachelor's degree. An additional ten (20.4%) TRAD HIRES had completed a Master's degree, and one person (2.0%) reported receiving a Doctorate or professional degree. No ASC HIRES had earned advanced degrees. The aviation coursework taken by the two samples differed consistently; proportionally more ASC HIRES took Associate degree coursework that was Bachelor's degree oriented and Bachelor's degree coursework concentrating in aviation operations.

Aviation Safety Inspectors - Airworthiness [ASI-AW]. Ten ASC HIRES and 115 TRAD HIRES were participating in this study as of May 12, 1987. All ASC HIRES except one qualified, at least in part, on the basis of prior work experience (see Table 2). Two of the 10 ASC HIRES (20%) were women, whereas only three of 115 TRAD HIRES (2.6%) were women. Similarly, five of the eight ASC HIRES (62.5%) for whom minority status information was available were nonminority; in contrast, 95.5% TRAD HIRES were nonminority. The average age of ASC HIRES (M = 33.80) was considerably lower than that of TRAD HIRES (M = 43.23). Most TRAD HIRES received veteran's preference (92.0%); however, only 30.0% of the ASC HIRES were veterans. Biographical information was available on six ASC HIRES and 78 TRAD HIRES. Of those responding, two ASC HIRES (33.3%) had received a Bachelor's degree, one (16.7%) an Associate degree, and the remaining three (50.0%) no degree. Of the TRAD HIRES, 61.5% had earned no college degree, 21.8% an Associate, 15.4% a Bachelor's degree, and 1.3% an advanced degree. The types of aviation coursework did not differ

substantially between the two groups, although proportionally more ASC HIRES took more aviation credit hours. Tests of statistical significance could not be run on any demographic information due to the small sample sizes.

Since the Airway Science register permits entry at the GS-7 level only, all ASC HIRES began at that grade; on the other hand, over 80% of the TRAD HIRES started as GS-11s or GS-12s during their ASI appointment which coincided with their participation in this project. Once again, GS-7 is a lower than usual entry-level grade in the ASI occupation. The TRAD HIRES sample consists of higher grade levels because it was designed to resemble "typical" TRAD HIRES. Also, all ASC HIRES began in the specialty area of General Aviation or "Other," whereas 55.7% of TRAD HIRES began in the Air Carrier specialty; an additional 32.2% of the sample initially were in General Aviation. Two ASC HIRES since converted to the Air Carrier specialty area.

The remaining occupations. The databases for the remaining occupations ATCS [Flight Service Station (FSS)] and Computer Specialist (CS), contained relatively little information. The primary reason for this was the low number of Airway Science candidates that had been hired into these occupations. With only one ATCS (FSS) and one CS ASC HIRE member, no meaningful information could be provided. Although 144 TRAD HIRES had agreed to participate in the project evaluation from the ATCS (FSS) occupation, there were no TRAD HIRE CSs. Briefly, the ATCS (FSS) qualified on the basis of a non-Aviation major and relevant work experience during or following his education. The CS ASC HIRE was an Aviation Management graduate.

Data Sources. Table 3 describes the questionnaires and supporting databases used in this project. With the exception of the Biographical Questionnaire, all other instruments were developed specifically to support the evaluation of the Airway Science Curriculum Demonstration Project. Readers are referred to Appendix D of the complete summative evaluation report (Clough, 1987) for more detailed information on the development and psychometric characteristics of the questionnaire subscales.

Procedure

Participation in this project was obtained by the signing of consent forms by willing new hires in the occupations of ATCS, ET, ASI, and CS. All ATCS new hires received the participation consent form during ATCS Indoctrination; Civil Aeromedical Institute (CAMI) staff described the project and requested participation. Regional human resources management offices were responsible for obtaining the consent of all ASC HIRES and for requesting the participation of non-ATCS TRAD HIRES. Once a participation consent form was received by the Human Resources Research Branch of CAMI, the individual was entered into the Airway Science databases, career tracking began, and questionnaires were distributed as needed.

The current version of the Biographical Questionnaire (BQ) as well as the Supplement to the BQ have been distributed since July 1985. Mailings of the other questionnaires were initiated in November 1986. At that time, an attempt was made to "catch up" and therefore all questionnaires that should have been mailed to the participant and his or her supervisor on or prior to November were sent. The preferred mailing date is triggered by the entry-on-duty date which corresponds to the individual's Airway Science project participation. Follow-up mailings to non-respondents and mailings

Table 3. Questionnaires and Additional Databases Used to Support the Airway Science Project Evaluation

QUESTIONNAIRES

1. Biographical Questionnaire (BQ)

   Purpose: To provide biographical information [i.e., educational degree(s), an overview of college coursework completed (including aviation education), certificates/ratings] and attitudinal information [i.e., reasons for occupational choice, FAA career expectations, perceived organizational role.]
   Procedure: This questionnaire is given to all ATCS developmentals during their first week in Oklahoma City (prior to FAA Academy training).

2. BQ Supplement

   Purpose: To provide more detailed information on the respondent's educational background [i.e., major(s), minor(s), colleges/universities attended] and Airway Science - relevant work experiences.
   Procedure: This instrument is completed by ATCS developmentals immediately following the BQ.

3. Initial Airway Science Questionnaire

   Purpose: To provide biographical information [i.e., educational degree(s), major(s), minor(s), colleges/universities attended, an overview of college coursework completed (including aviation education), certificates/ratings, Airway Science - relevant work experiences] and attitudinal information [i.e., reasons for occupational choice, FAA career expectations, perceived organizational role].
   Procedure: This survey is mailed to all research participants [non-ATCS] once their participation in the project has been established. It must be sent prior to their fourth month in the project.

4. Status Survey

   Purpose: To indicate any educational and/or career changes for tracking purposes. [This is designed to corroborate personnel or training actions noted in the FAA's automated personnel database.] Also, the respondent's perceptions of and attitude toward his or her job, supervisor, coworkers, role within the FAA, and the FAA itself are measured.
   Procedure: Beginning approximately one year after the participant's entry-on-duty date, this instrument is mailed once a year to all research participants still with the FAA.

5. Training Progress Reports

   Purpose: To document the training progress of research participants in the occupations of Electronics Technician and Aviation Safety Inspector and to provide appropriate criteria to compare the training progress of the experimental and comparison groups. Also incorporated at the end of this questionnaire is the Index of Managerial Potential described below.
   Procedure: Different reports have been developed for ETs and ASIs which are completed by participants' supervisors. Beginning approximately one year after the participant's entry-on-duty date, this instrument is completed yearly.

6. Index of Managerial Potential

   Purpose: To measure the extent to which research participants exhibit the skills closely aligned with effective human resource management. In addition, predictions regarding the likelihood that the individual can one day be a supervisor are requested.
   Procedure: This instrument is distributed to participants' supervisors approximately one year following entry-on-duty date and each year subsequently. As mentioned above, with ETs and ASIs, it is appended to the Training Progress Report. With ATCS, it is sent by itself. This Index also is sent to the supervisors of participants who are no longer in their original occupational series but are still in a job covered by the Airway Science project.

SUPPORTING DATABASES

1. Consolidated Personnel Management Information System (CPMIS): Serves as the FAA's automated personnel system. Data from this database includes sex, minority status, veteran's preference, starting position (occupation, specialty, grade, appointment type, facility, region, supervisory level, annual performance rating), career tracking (changes in the above elements), and attrition.

2. Civil Aeromedical Institute ATCS (T/E) Selection Database: Includes scores on the OPM ATC Selection Test, all test and laboratory scores from Phase II and the non-radar laboratory Screen as well as global measures of performance.

3. Airway Science Curriculum Database: Designed and maintained by the University Aviation Association, this database includes all actions (and dates) taken on Airway Science curriculum proposal submissions.

being initiated following November are being sent on this "Airway Science date." Questionnaires are mailed to appropriate respondents and supervisors on a monthly basis.

RESULTS

Only statistically significant differences were documented in this paper. When a sample size was 1000 or more, a "p value" of at least .01 was required to describe a finding as statistically significant. With smaller sample sizes, the cutoff "p value" was .05. The statistical power was sufficient with relatively large samples to warrant a more stringent requirement. With a "p value" of .05 and over 1000 members in the sample, many findings were statistically significant that were of questionnable practical significance.

Project Objective 1: To Assess the Unique Impact of an FAA Recognized Airway Science Degree

This objective focuses exclusively on the perceptions and behaviors of Airway Science graduates as compared with those who do not have an Airway Science degree. Unfortunately, in May 1987, no reliable mechanism was in place to identify Airway Science graduates who entered the agency as a result of the traditional (rather than Airway Science) selection approach. When sufficient data are available, two specific areas will be investigated in support of this objective. (At this time, the number of Airway Science graduates is too few to compute meaningful statistics.) First, it was hypothesized that Airway Science graduates might be more committed to a career in aviation. Second, and related, it was hypothesized that less attrition might be evident with Airway Science graduates than with others.

Two types of attrition are possible and both will be examined. Specifically, an individual may change occupations but remain in the FAA; this is referred to as occupational attrition. The second type is agency attrition which is exit from the FAA. One hypothesis is that all attrition may be lower with Airway Science graduates. On the other hand, if occupational attrition is necessary (e.g., due to a failure in training), it may not result in agency attrition because the individuals may be more committed to remaining with the FAA and may, due to their varied backgrounds, be qualified for multiple positions.

In addition to the two areas mentioned above, this objective also provides the basis for a focused analysis of Airway Science graduates within the larger experimental groups of ASC HIRES for project Objectives 3 through 8. It is important to recognize the significance of this objective to the long-term project evaluation. It is expected that the number of Airway Science graduates selected into the FAA occupations of interest will be sufficiently large to permit an examination of this objective in the future.

Project Objective 2: To Enhance FAA Ties with Universities/Colleges Offering Aviation-Related Degrees

The data relevant to this discussion were compiled in April 1987 by the UAA from its Airway Science Curriculum database. At that time, there were 29 colleges and universities across the country with recognized Airway Science

programs. One additional school previously had an FAA recognized program. That recognition was suspended, however, when it was discovered that the program had not been implemented as proposed; the school was in the process of working to reestablish its prior status. The majority of Airway Science programs received FAA recognition when the Demonstration Project began in 1983 (see Figure 1). Twenty-four of the 30 institutions had Airway Science Management degree programs. In addition, 20 and 18 schools, respectively, had recognized Airway Computer Science and Aircraft Systems Management programs. There were 26 colleges and universities with recognition in more than one area of concentration suggesting strong support for the Airway Science program by participating schools. In fact, 10 institutions had returned to the FAA to request recognition in areas of concentration in addition to those originally proposed.

Perhaps a more comprehensive index of university support for the Airway Science program is attained by examining the number of Airway Science curriculum proposal submissions. As previously mentioned, institutions interested in receiving FAA recognition of their Airway Science program must successfully complete an extensive proposal review. The curriculum proposal review process was designed to ensure the academic integrity of the Airway Science program. Submission of a curriculum proposal represents, from the FAA's perspective, a valid measure of interest in the Airway Science program since even curriculum proposal development requires an institutional commitment of time and other resources.

Figure 2 illustrates the number of Airway Science proposals received in each area of concentration (AOC) from 1982 through 1987. In these statistics, one school applying for five AOCs counts five times (one per AOC). However, a given curriculum proposal (regardless of the number of times it may be resubmitted) counts only once. The number of proposal submissions has varied substantially from one year to the next with a high of 51 in 1983 and a low of eight in 1986. During 1987 (as of April), 19 proposals had been received from nine schools. Considering that only 4 months had elapsed in 1987, the proposal submission rates were up markedly (see also Figure 3). The number of 1987 proposal submissions for four of the five AOCs was already higher than that of the previous year; the number of 1986 and 1987 submissions was identical for the remaining AOC (see Figure 2). [Note: Figure 3 differs from the preceding two charts in that institutions rather than AOCs were counted, and only initial proposal submission and recognition were recorded.]

Several hypotheses have been suggested to explain the proposal submission and recognition levels previously described. The majority of institutions receiving Airway Science program recognition in the first 2 years had longstanding aviation programs which required relatively minor modifications to accommodate the Airway Science degree requirements (G. W. Kiteley, personal communication, May 1987). More recently, more of the schools submitting curriculum proposals (some of which eventually have achieved FAA recognition) have developed their Airway Science programs without a strong background in aviation. Their involvement in Airway Science represents an attempt to initiate aviation education within their institution.

An FAA program which probably contributed to the fluctuations in proposal submission rates was the Airway Science Grant Program which was designed to provide selected institutions with partial funding for the enhancement of their Airway Science program. Specifically, awarded funds can be used to

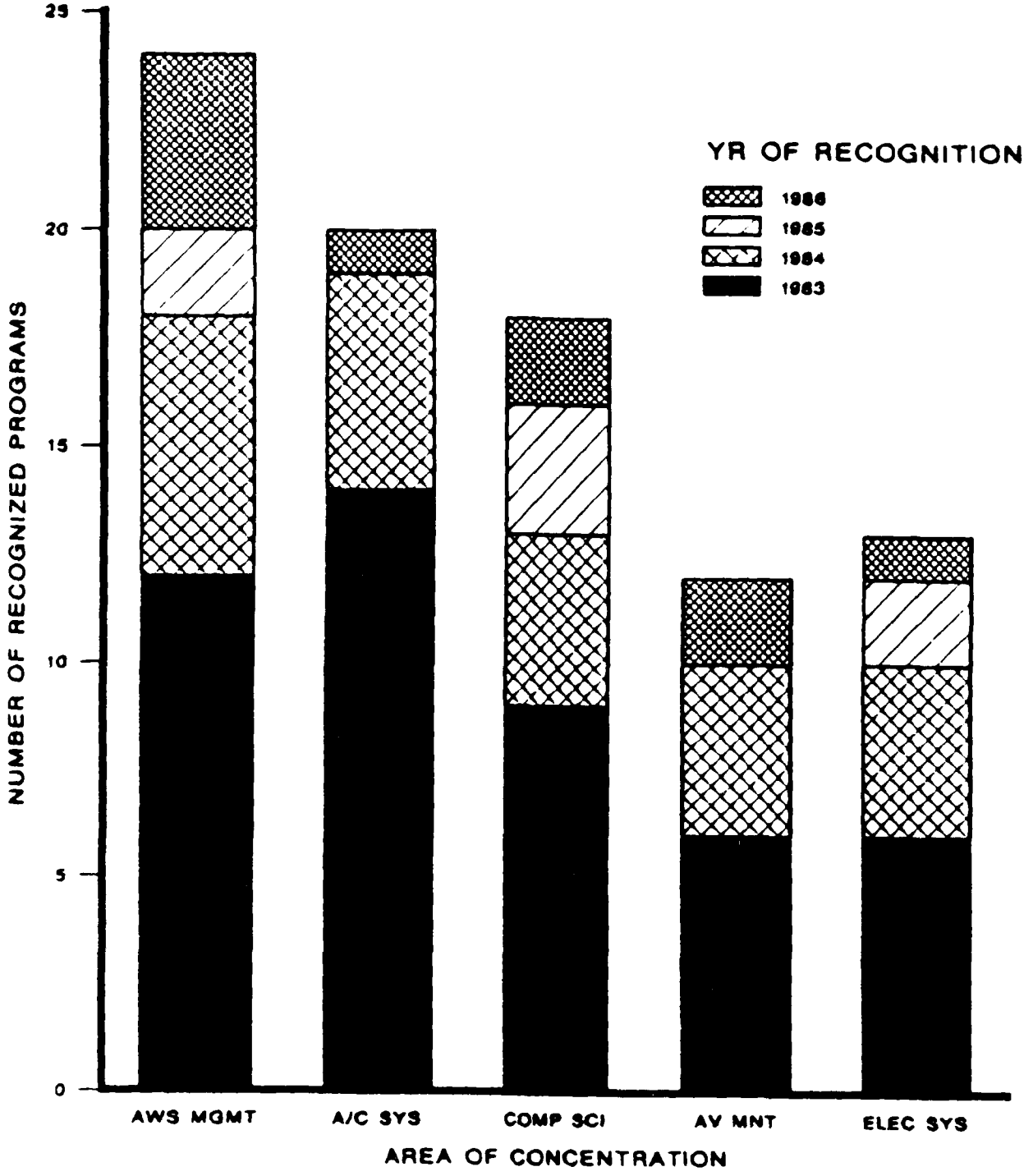

Figure 1. Airway Science Recognized Programs: Areas of Concentration by Year.

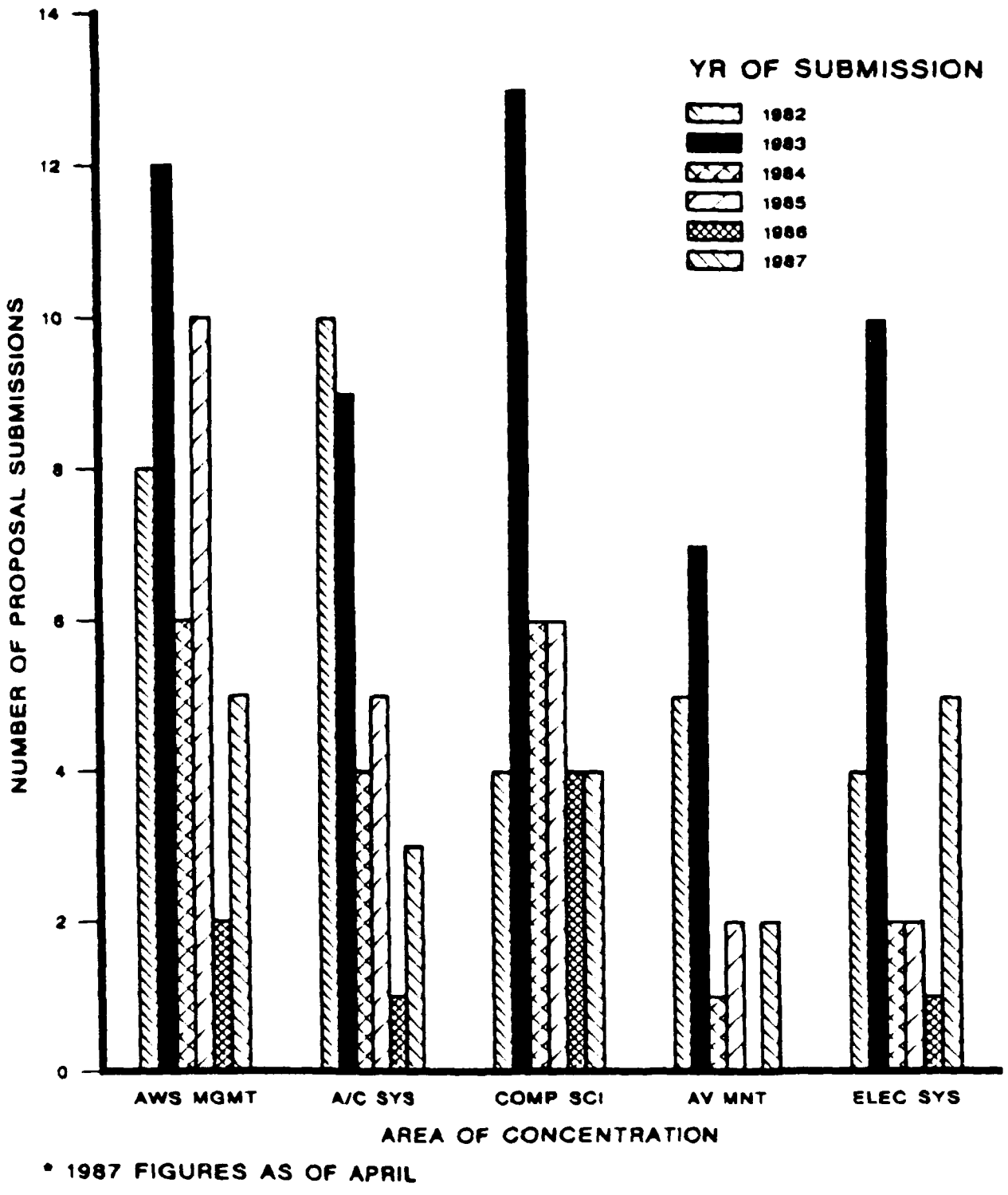

Figure 2. Airway Science Proposal Submissions: Areas of Concentration by Year

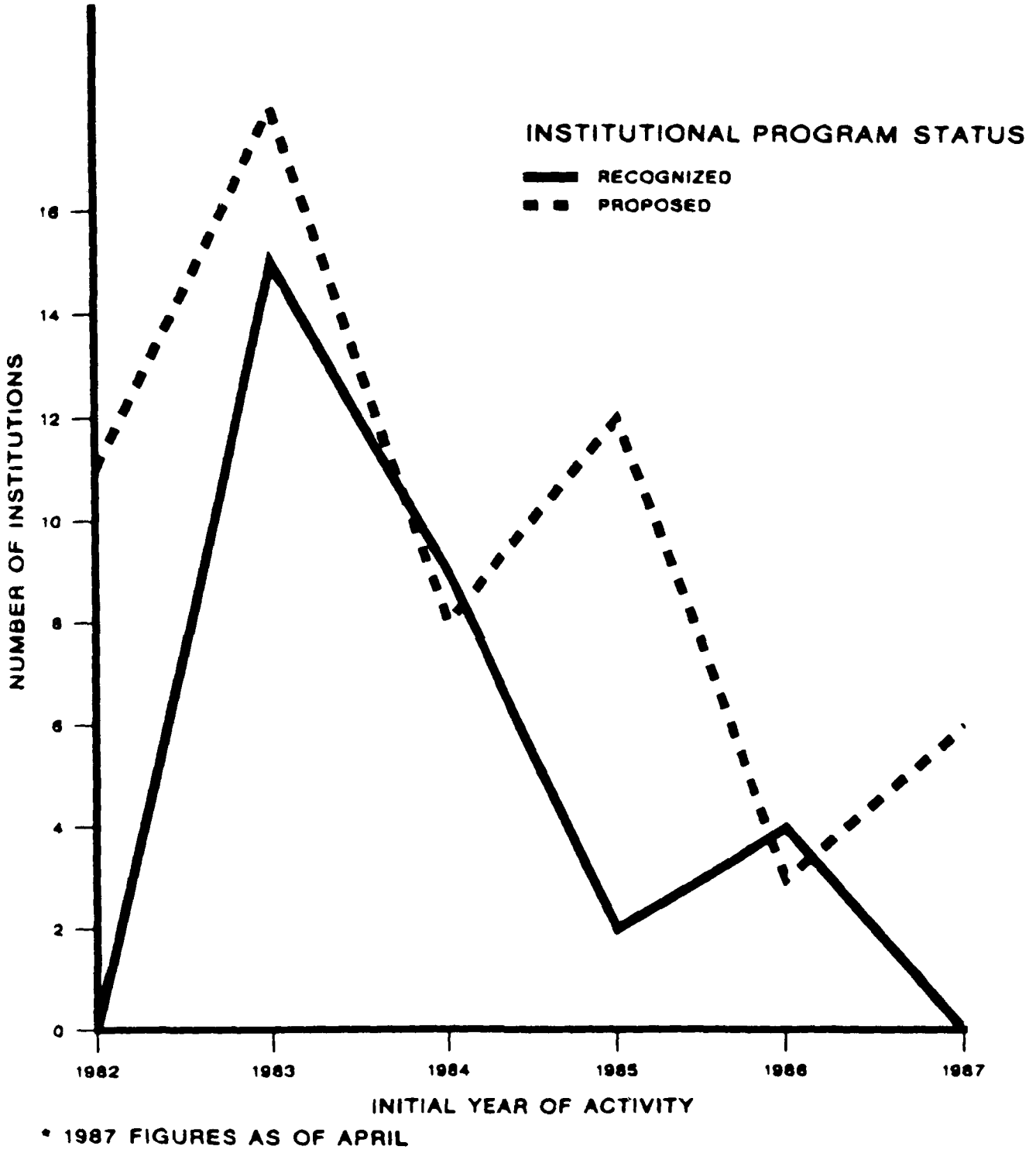

Figure 3. Institutional Activities Per Year: First Proposal Submission Versus Initial Recognition

support the purchase, lease, or construction of buildings or associated facilities, or non-expendable instructional materials or equipment, and are to be used in conjunction with an FAA recognized Airway Science curriculum. During CY-84, the grant proposal solicitation was limited to Historically Black Colleges and Universities (HBCUs); interested HBCUs were required to submit an Airway Science curriculum proposal to the FAA prior to submitting a grant proposal. During CY-85, all institutions that had submitted a curriculum proposal prior to October 16, 1985, were eligible to compete for grant monies. The relatively high number of curriculum proposals submitted in 1985 may have been due, in part, to the grant solicitation. The CY-87 competitive grant award was restricted to those institutions with recognized Airway Science programs prior to December 31, 1986.

It is unlikely that the majority of institutions have become involved in the Airway Science program solely because of the availability of federal funds. As previously discussed, the curriculum review process alone is very thorough and difficult. In addition, institutions must totally support human and other resources to initiate, develop, and maintain their Airway Science program. The Grant Program may have served as a catalyst to colleges/universities with an interest in aviation, encouraging them to institute their own Airway Science degree program. The Demonstration Project and the Airway Science Grant Program both serve to complement the FAA's objective in enhancing its ties with aviation higher education.

Project Objective 3: To Maintain the Technical Competence of the FAA Workforce During a Period of Rapid Technological Change

Occupations were examined separately. At this point, technical competence was assessed via training activities and performance. As might be expected, the training and the manner in which performance was measured differ substantially between occupations. It should be recognized that technical training within the FAA is not all classroom instruction, but rather involves extensive work (both on-the-job training and independent) in the field. Although the Human Resources Research Branch maintains data on ATCS (T/E) field training, this database has not yet been fully integrated with the Airway Science project evaluation database. Therefore, the focus of the present discussion is on performance in the non-radar screening program which is administered to new trainees at the FAA Academy upon entry on duty. ATCS students must pass this screen to remain in ATCS (T/E) training. For the purposes of the Airway Science project evaluation, pass rates are determined on the basis of the trainee's last entrance into the FAA Academy. For example, the second pass/ fail/withdrawal outcome would be the one used to compute the pass rate for trainees who recycle through the program. This strategy for determining pass rates was selected because most of the interest in the Airway Science program evaluation is focused on tracking the success of individuals.

ATCS (T/E) Training Performance

The initial qualification training of ATCSs (T/E) was altered substantially following the class which ended in December 1985. Prior to 1986, incumbents were placed in the terminal or en route options before beginning the program with a unique initial pass/fail screen for each option. With the class that began training in October 1985 (and graduated in January 1986), a common

initial qualification screen was established and terminal/en route option placement was moved to after the pass/fail screen. As a result of the changes to the pass/fail screen program, the former terminal and en route screens and the current "common screen" must be examined separately. One component of the screen which remained consistent during the transition was Phase II. This was exclusively classroom instruction designed to provide students with basic knowledge of aviation and air traffic control. In comparing the performance of ASC and TRAD HIRES in Phase II, no differences on the basis of hiring status were observed.

Former Terminal and En route Screen Programs. Since there appeared to be no pattern in the assignment of ASC and TRAD HIRES into terminal and en route screens, the two screens were combined for the purposes of analysis. Thirty-five ASC HIRES and 323 TRAD HIRES participated in the project evaluation. As Table 4 indicates, the pass rate of ASC HIRES was significantly lower than that of TRAD HIRES ($\chi^2 = 10.53$, $p < .01$).

Table 4. Pass/Fail Rates in Non-Radar Training for Airway Science and Traditional Hires (as of May 12, 1987)

FORMER TERMINAL AND EN ROUTE PROGRAMS:	Pass		Fail		Withdraw/ Incomplete		Total	
	n	%	n	%	n	%	n	%
Airway Science Hires	15	42.9	19	54.3	1	2.9	35	100.0
Traditional Hires	211	65.3	90	27.9	22	6.8	323	100.0
CURRENT COMMON SCREEN PROGRAM:								
Airway Science Hires	27	44.3	27	44.3	7	11.5	61	100.0
Traditional Hires	1358	65.2	596	28.6	128	6.1	2082	100.0

Common Screen Program. Sixty-one ASC HIRES and 2082 TRAD HIRES had completed the screen as of May 12, 1987. As Table 4 suggests, the pass rate of ASC HIRES was significantly lower than that of TRAD HIRES ($\chi^2 = 11.68$, $p < .005$). It would be useful to look at the relative performances of the various subgroups of ASC HIRES as classified by the eligibility scheme previously described; however, cell sizes were too small to identify any trends. Since it is important to determine whether specific subgroups of ASC HIRES are performing much worse (or better) than the others, larger sample sizes are necessary to fully assess ATCS training performance.

Components of the non-radar screen were examined to identify those aspects of the program responsible for the lower ASC HIRES performance. Briefly, it was observed that ASC HIRES scored significantly lower on the laboratory

simulation problems as measured by both the average technical and instructor assessments ($F(1,1983) = 13.92$ $p < .0005$; $F(1,1983) = 15.60$, $p < .0001$). In addition, the average score of ASC HIRES on the non-radar Laboratory Controller Skills Test was almost nine points lower than that of TRAD HIRES ($F(1,1981) = 26.33$, $p < .0001$).

Two predictors of non-radar screen performance which have been established from years of research at the Civil Aeromedical Institute are age at the time of training and performance on the Office of Personnel Management Air Traffic Controller Selection Test (Collins, Boone, VanDeventer, 1981; P. Kegg, personal communication, June 1987). Generally, younger people are more likely to succeed in training, as are individuals who score higher on the Selection Test. [It was found that the average ages of ASC and TRAD HIRES at the time that they entered the non-radar screen did not differ.]

The typical selection approach is based solely on performance on the ATC Selection Test. In a sense, the Airway Science hiring program is being compared to the Selection Test with regard to its predictive power. Since only 10% of the ASC HIRE rating is based on the Selection Test, it is not surprising that ASC HIRES scored significantly lower than TRAD HIRES on the test ($F(1, 2021) = 61.09$, $p < .0001$). In an attempt to determine whether the lower test performance could be a factor in the lower non-radar screen performance, an hierarchical regression was completed in which any variation in the screen final score which was explained by performance on the ATC Selection Test was statistically removed. The differences between ASC and TRAD HIRE non-radar screen performance disappeared (see Table 5). This finding should not be interpreted as a recommendation to abolish the Airway Science ATCS selection standards. However, this aspect of the hiring program merits close examination as the number of ASC HIRES, particularly the grossly underrepresented Airway Science graduates, increases.

Performance in the non-radar screen is just one aspect of an ATCS's training. It was, and will continue to be, closely monitored since it operates as the initial screening mechanism for entrance into the field of air traffic control in the terminal and en route environments. However, field training also is an important measure of the technical competence of ATCS incumbents. The capacity of ASC HIRES as compared with TRAD HIRES to perform in the field will be investigated in the future.

Table 5. Hierarchical Regression of Selection Criteria on Official Non-Radar Lab Composite Score

Step	Selection Measure	R^2	β	t
1.	Transmuted Composite ATC Selection Test	.059	.243	10.68 ****
2.	Hiring Status (Airway Science versus Traditional Hire)	.059	.011	0.51

**** $p < .001$

ET Training Performance

To obtain information on the training activities of project evaluation participants, a Training Progress Report was sent to supervisors of participants with one or more years in the agency. Responses were received for 12 ASC HIRES and 12 TRAD HIRES. These sample sizes were too small to analyze categorical data statistically; therefore, the findings are reported for descriptive purposes only. The majority of ETs, regardless of hiring status, completed at least one directed study/correspondence course within their first year; half of the ASC HIRES and slightly more (63.6%) TRAD HIRES received Computer-Based Instruction; 40% of TRAD HIRES and 43% of ASC HIRES completed one or more field courses; and 58.3% of ASC HIRES and 63.6% of TRAD HIRES enrolled in one or more resident/ Academy courses. Only one TRAD HIRE failed any coursework. Twenty-five percent of ASC HIRES successfully completed one or more performance examinations whereas two-thirds of TRAD HIRES completed at least one.

The training progress of most participants was thought to be on schedule or ahead of schedule (see Table 6). Again, this information is provided as background on how the two samples are performing and does not imply how ASC and TRAD HIRES will do in the future. Finally, supervisors were asked to: (a) characterize the participant's ability to apply coursework; (b) assess the pace of the person's OJT progress; (c) evaluate his or her ability to apply what was learned in OJT; and (d) rate the person's training performance as compared with all other ETs. Although the sample sizes are small, statistical comparisons of the rating data using ANOVA were possible. The ratings were completed using a five-point scale in which a rating of "3" is average. In all cases, both ASC and TRAD HIRES average ratings are at least 3.0 suggesting that neither group is subpar. It was found that the pace of the ASC HIRE sample's OJT progress ($M = 4.17$) was rated as slightly (but significantly) faster than that of TRAD HIRES ($M = 3.42$) ($F(1,22) = 5.09$, $p < .05$).

ASI-OP Training Performance

Training Progress Reports were also administered for both ASI occupations. Data were available for 12 ASC HIRES and 27 TRAD HIRES. Within the past year, the majority of participants completed at least one resident/Academy course (ASC: 100.0%; TRAD: 65.4%); received OJT (ASC: 100.0%; TRAD: 66.7%); and worked independently (no longer receiving OJT) on at least one major job function/task (ASC: 66.7%; TRAD: 92.6%). Again, this information cannot be analyzed statistically at this point but is provided to describe the training activities of participants. Most participants were either consistent with or ahead of what was expected with regard to their training progress (see Table 6). ASI supervisors were asked to rate the same aspects of training performance as ET supervisors. The only statistically significant difference between ASC and TRAD HIRES was with the perceived pace of OJT progress ($F(1,35) = 5.02$, $p < .05$). ASC HIRES were perceived as moving at a somewhat slower pace ($M = 3.67$) than TRAD HIRES ($M = 4.32$) although the ASC HIRES average rating on this item was acceptable.

ASI-AW Training Performance

Training Progress Report responses were received for 7 ASC HIRES and 50 TRAD HIRES. Once again, information is provided only for descriptive purposes and

Table 6. Training Progress of Airway Science and Traditional Hires
(as of May 12, 1987)

OCCUPATION:	ET				ASI-OP				ASI-AW			
Type of Hire	ASC		TRAD		ASC		TRAD		ASC		TRAD	
	n	%	n	%	n	%	n	%	n	%	n	%
Actual Progress Relative to Expected:												
Consistent with Expected	7	63.6	5	41.7	7	58.3	18	66.7	2	33.3	22	44.9
Ahead of Schedule	3	27.3	5	41.7	4	33.3	8	29.6	4	66.6	22	44.9
Behind Schedule	1	9.1	2	16.7	1	8.3	1	3.7	0	.0	5	10.2
Reason is Ahead of Schedule:												
Not Applicable	6	54.5	7	58.3	6	54.5	10	45.5	2	28.6	12	27.3
Availability of Resident Courses												
Prior Knowledge/Experience	2	18.2	1	8.3	0	.0	3	13.6	0	.0	13	29.5
More Training Time Available than Originally Agreed to	0	.0	1	8.3	0	.0	0	.0	1	14.3	0	.0
High Motivation	3	27.3	3	25.0	5	45.5	9	40.9	4	57.1	19	43.2
Reason is Behind Schedule:												
Not Applicable	10	90.9	10	83.3	11	91.7	23	95.8	6	85.7	38	88.4
Necessary Resident Courses Not Available	0	.0	0	.0	0	.0	1	4.2	1	14.3	4	9.3
Has Failed and/or Had Difficulty Passing Courses	0	.0	0	.0	0	.0	0	.0	0	.0	0	.0
Less Training Time Available than Originally Agreed to	0	.0	2	16.7	0	.0	0	.0	0	.0	0	.0
Lack of Motivation	1	9.1	0	.0	1	8.3	0	.0	0	.0	1	2.3

Note. ET = Electronics Technician; ASI-OP = Aviation Safety Inspector - Operations; ASI-AW = Aviation Safety Inspector - Airworthiness; AWS = Airway Science Hire; TRAD = Traditional Hire

not to assess group differences between ASC and TRAD HIRES. As with the ASI-OP occupation, most participants had completed one or more resident/Academy courses (ASC: 6 of 7 (85.7%); TRAD: 84.0%); received OJT (ASC: 5 of 6 (83.3%); TRAD: 90.0%) and were able to work independently (ASC: 4 of 6 (66.6%); TRAD: 88.0%). The majority of ASC HIRES were described as ahead of what was expected with regard to their training progress (see Table 6). ASC HIRES were rated significantly lower than TRAD HIRES in their ability to apply what had been learned in OJT; however, once again, even the average rating of ASC HIRES was acceptable (M = 3.4).

Project Objective 4: To Develop Within the FAA Workforce an Increased Acceptance of Technological Change

The data to respond to this objective came from two sources: the Biographical Questionnaire in which the incumbents' expectations regarding increased automation were asked and the Status Survey which was sent to employees after being with the agency for one year or more. Due to missing data, the expectation questions were analyzed for only ATCS (T/E). No statistically significant differences were observed between ASC HIRES and TRAD HIRES with regard to the likelihood that: (a) greater automation will occur in the future; or (b) negative feelings will result from increased automation in the workplace.

The remaining questions were asked of those who had been in their positions for one or more years; all four occupational groups were considered. Regarding the respondents' predictions that increased automation will affect job tasks in the future, when examining differences between ASC and TRAD HIRES within each occupation, ASI-OP ASC HIRES predicted less likelihood of change than ASI-OP TRAD HIRES ($F(3,182) = 3.01$, $p < .05$). All other intra-occupational differences were non-significant. The only observed group differences occurred with the four occupational groups and their feeling that increased automation would influence their effectiveness. Of interest in the project evaluation are differences between ASC and TRAD HIRES in general, and then within each occupation if the main and interaction effects, respectively, are statistically significant; general differences between the occupations as a whole are not relevant to this review. No differences were found when considering respondents' feeling that increased automation would affect job satisfaction or job challenge. In summary, hiring status had very little influence on expectations, knowledge, or feelings regarding increased automation at work.

Project Objective 5: To Recruit and Hire Individuals with Managerial Potential

The Managerial Skills Scale (MSS) was designed to identify the extent to which project participants demonstrate the skills linked to effective human resource management. Also, respondents (the participants' supervisors) were asked to predict whether the participant has the potential at some point to be a supervisor and when that might be. (See Appendix D in Clough, 1987 for a thorough description of the contents and psychometric characteristics of the scales described in this and later sections.)

Conclusions drawn from the MSS survey must be considered preliminary since:

(a) most hires after their first year are still in training status (ATCS supervisors in particular responded negatively to evaluating the management potential of an individual who has not yet been able to demonstrate whether he or she is capable of being a competent controller); and (b) in the ASI profession especially, ASC HIRES enter the agency at a much lower grade than the majority of TRAD HIRES and therefore might be expected to have less opportunity to demonstrate supervisory skills than their TRAD HIRES counterparts.

As expected, there were significant differences between the managerial skills of the ASC HIRES and TRAD HIRES samples within certain occupations (as measured by the MSS) ($F(3,675) = 2.90$, $p < .05$). ET ASC HIRES were perceived as showing greater skills than ET TRAD HIRES. This measure is likely to become increasingly accurate as each supervisor has a longer time to interact with his or her employees.

The next set of items was contained in the Status Survey and was answered by participants with one or more years in the FAA. No significant differences were found with regard to the extent that respondents: (a) felt intellectually challenged by their jobs; (b) perceived advancement opportunities; (c) indicated that becoming a manager or supervisor was personally important; or (d) were satisfied with their chances of receiving a promotion.

Project Objective 6: To Attract Individuals with Greater Awareness of and Skills in Maintaining Positive Human Relations

Relevant Biographical Questionnaire items referred to the importance of and expectations regarding skill utilization, participative decision-making, and other intrinsic factors of the job. Selected expectation questions were combined to create the Work-Related Challenge Scale to address aspects of this issue. Again, the data were analyzed using only the ATCS (T/E) sample and no significant differences on the basis of hiring status were found. In fact, both ASC and TRAD ATCS expected to be challenged by the job; the average response for the two groups was 4.1 on a five-point scale. Similarly, the occupational choice items of intellectual challenge, autonomy, opportunity to work with competent people, ability to control workload, and prestige of the job were examined and were found to be unrelated to hiring status. Because of the agency's strong concern with the human relations skills of its supervisors, several of the questions previously discussed under Objective 5 are relevant. The MSS includes interaction skills such as oral communication and interpersonal skills. No significant differences were observed with these individual ratings.

Several questions on the Status Survey also pertain to an interest in or feelings toward human relations concepts. It was found that ASC HIRES as a group perceived slightly less autonomy in their jobs ($M = 2.88$) than did TRAD HIRES ($M = 3.42$) ($F(1,186) = 6.40$, $p < .05$). Although the Hiring Status x Occupation interaction overall was not statistically significant, the above finding was especially apparent with ASI-OP participants wherein ASC HIRES had an average rating more than one point lower than the average of TRAD HIRES. In reflecting on the entry grades (and probable experience) of the two groups, differences in actual work assignments may account for the previous finding. Also, ATCS ASC HIRES assigned slightly less importance to

having tasks that used many skills and abilities (M = 3.22) than did their TRAD HIRES counterparts (M = 3.92) ($F(3,186) = 2.65$, $p = .05$); the remaining differences within each occupation were non-significant. No differences between ASC and TRAD HIRES were observed for the following perceptions regarding the extent to which each was provided by their FAA job: (a) opportunity to work with competent people; (b) tasks that require a number of skills and abilities; or (c) the opportunity to make a substantial impact on the lives of others. In addition, the following factors were rated as no more important to one group than the other: (a) intellectual challenge; (b) autonomy; (c) working with competent people; (d) the opportunity to make an impact on the lives or work of others; or (e) the opportunity to contribute to decisions that affect one's job.

Project Objective 7: To Increase Female and Minority Representation Within the FAA

There was insufficient data to adequately address this issue. Statistics comparing the demographics of ASC and TRAD HIRES were possible only with the ATCS (T/E) sample. No differences in the representation of women and minorities were observed. However, in both ASI-OP and ASI-AW, the percentages of women and minorities in the ASC HIRES sample were substantially higher than those of TRAD HIRES (refer to the relevant Project Participant sections earlier in this report). Again, without statistical comparisons, it cannot be determined whether this was likely to be a consistent pattern or merely due to chance. Clearly this is an aspect of the project that requires close examination in the future.

Project Objective 8: To Improve Employee Perceptions of the FAA

This project objective is designed to examine feelings that employees have regarding their job, supervisor, and coworkers. Several questions from the Biographical Questionnaire relate to expectations regarding satisfaction with general work factors. Four satisfaction expectation scales were developed, two of which were relevant to this objective. Again, these data were examined only for ATCS (T/E). No differences were found with regard to the extent to which participants expected to be satisfied with the "basics" (e.g., salary, benefits) as measured by the Basics Scale. In addition, the Scale of Management Focus, which measured the extent to which employees believe in the FAA management structure, was developed. No statistically significant differences were observed between ASC and TRAD HIRES.

Of greater interest is the reported satisfaction of employees with experience in the agency. Five factors were identified from the satisfaction items in the Status Survey. The resulting scales tapped general job satisfaction, supervisor satisfaction, coworker satisfaction, and personal control. No statistically significant differences between ASC and TRAD HIRES were observed with the General Job Satisfaction Scale, Supervisor Satisfaction Scale, or the Coworker Satisfaction Scale. With regard to pay satisfaction, ASI-OP ASC HIRES reported slightly less satisfaction with their pay (M = 2.00) than did their TRAD HIRE counterparts (M = 2.94) ($F(3,186) = 3.58$, $p < .05$). No differences due to hiring status were significant with the other occupations.

DISCUSSION

As stated at the outset, the purpose of this report was to describe the status of the Airway Science program relative to its eight objectives shortly before the end of its fourth year of implementation. This report also served as the basis for the agency's request to the Office of Personnel Management for an extension to the 5 year demonstration project. Issues addressed include global intentions of the program such as the desire to enhance the ties with collegiate aviation education as well as areas of concern specific to the FAA such as recruiting and selecting individuals with managerial potential and a readiness to accept technological change. At this stage of the program, few consistent differences were observed between Airway Science and traditional hires.

Within this evaluation report, two aspects of the Airway Science project were noteworthy. First, interest on the part of the academic community was evident and appeared to be strong. Although the majority of institutions with recognized Airway Science programs received FAA recognition in the first year of the project, submission rates for curriculum proposals appeared to be up markedly in 1987. In addition, it has been suggested that the type of academic institution pursuing participation in the Airway Science program may be changing to some extent. Within the past several years, proportionally more of the colleges and universities submitting Airway Science curriculum proposals were relatively new to aviation education. Thus, the Airway Science program may be promoting the growth of collegiate aviation education.

The second finding that should be mentioned is the relatively lower pass rates of Airway Science hires as compared with traditional hires in the FAA Academy's air traffic control (terminal/en route) screen program. Preliminary evidence suggests that the lower pass rate may be linked to lower scores on the OPM ATC Selection Test. Since test performance accounts for only 10% of a candidate's Airway Science rating, a higher weighting of the Selection Test may be warranted. As a greater number of Airway Science hires complete the program, it should be possible to determine the relative impacts of college education and work experience that may relate to success or failure in the screen.

The original premise of the Airway Science program was that a broader-based background may become increasingly important as an individual rises into supervisory and managerial ranks. The evidence used to evaluate the program to this point has largely focused on technical competence and new employee perceptions and expectations about work. These short-range measures were all the information that was available to date; however, they do not adequately assess the longer term aspects of the Airway Science project. For example, to determine project participants' ability to accept and adapt to technological change, their performance and perceptions will need to be examined as such changes occur within their workplace. Also, as previously mentioned, it was thought that the knowledge, skills, and abilities obtained through completion of an Airway Science degree would be valuable as individuals attempted to bid on and perform in supervisory positions. Hiring in support of the Airway Science program began in 1984; it will be several years before any movement into supervisory positions can be anticipated.

Finally, it must be recognized that only five Airway Science graduates have been selected into the FAA (others qualified for the Airway Science register

by demonstrating "equivalent" college education or work experience). Graduates of the unique Airway Science curriculum are the subgroup of Airway Science hires in which the agency is most interested. Increasing numbers of Airway Science graduates are expected to enter the FAA in the future. Academic institutions first received FAA recognition for Airway Science programs in 1983. Therefore, students who were freshmen when the programs were first put into place will be graduating in 1987 or 1988. Also, approved refinements to the Airway Science curriculum review process should make the Airway Science degree more salient to undergraduate students interested in an aviation career, thereby increasing student enrollments (and the resulting applicant pool).

The time required to establish the Airway Science program, given its ambition to link collegiate aviation education with entry into FAA technical occupations which themselves require several years of additional training, extends well beyond the initial 5 year demonstration project duration. It is recommended that those with an interest in the Airway Science project recognize and accept the limitations of this preliminary assessment. To date, graduates of recognized Airway Science programs have not been examined separately from all other "look-alike" Airway Science hires. Again, although very few Airway Science graduates have been selected, this is expected to change in the very near future as the first undergraduate students complete the 4 to 5 year program. In addition, the project evaluation has focused primarily on technical competence observed in the first year of training. The Airway Science background was not expected to improve the technical competence of the incumbent workforce; rather, a strong technical orientation was rejected in favor of a relatively broad-based exposure to a variety of subject areas which were thought to enhance other aspects of an employee's contribution to the FAA over the years of his or her career. Although adequate technical competence is required to continue within each of the relevant occupations, the expected pay-offs of the Airway Science program are several years in the future. It is only at that time that an objective, balanced appraisal of this program can be complete.

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Appendix A
Airway Science Curriculum Demonstration Project Objectives

ORGANIZATIONAL GOAL #1: To explore the possibility and to determine the eventual consequences of restructuring the FAA career system link with the academic community. As presently envisioned, aviation education and training traditionally borne solely by the FAA will be shared by the individual and academic institutions.

Objective 1: To assess the unique impact of a tailor-made baccalaureate curriculum (i.e., an FAA-recognized Airway Science program) on:

a. One's interest in pursuing an aviation-related career

b. Occupational and organizational attrition

c. Objectives 3 through 8

Objective 2: To enhance FAA ties with universities/colleges offering aviation-related degrees

ORGANIZATIONAL GOAL #2: To develop a cadre of highly qualified individuals well-suited to occupations integral to the future National Airspace System

Objective 3: To improve the technical competence of the FAA workforce

Objective 4: To develop within the FAA workforce an increased acceptance of technological change

Objective 5: To recruit individuals with managerial potential

Objective 6: To attract individuals with greater awareness of and skills in maintaining positive human relations

ORGANIZATIONAL GOAL #3: To promote socially responsible personnel policies and practices

Objective 7: To increase female and minority representation within the FAA

Objective 8: To improve employee perceptions of the FAA

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